

2.—SIMPSONITE (sp. nov.) FROM TABBA TABBA, WESTERN AUSTRALIA.

By H. BOWLEY, F.A.C.I.

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During October 1934 a few specimens of a creamy crystalline detrital mineral ranging in specific gravity from 5.92 to 6.05 were received at the Government Laboratory with the information that they came from Mining Lease 312 being worked for manganotantalite at Tabba Tabba in the North-West Division.

The freshly fractured surfaces showed that they consisted of a transparent colourless mineral intergrown with a creamy white translucent material. The crushed powder is almost pure white. A preliminary chemical examination of one crystal by D. G. Murray showed the presence of much tantalic oxide with a large amount of aluminium, an appreciable quantity of lime with some sodium and fluorine and traces only of iron and manganese. This was sufficient to indicate that it was a mineral not previously recorded so it was decided to give it the name Simpsonite in honour of Dr. E. S. Simpson who has held the position of Government Mineralogist in this State since 1897 and who, during that period, has made many outstanding contributions to our knowledge of Western Australian minerals, particularly the study of tantalum-bearing minerals.

In 1935 we were indebted to Mr. A. L. Kennedy for a further small parcel (8 lbs. in weight) of similar material from the same locality. As all the specimens appeared to be much weathered and intergrown with an alteration product, the publication of a description of them was held over in the hope that further work on the original matrix of the mineral, a tantaliferous pegmatite vein, would reveal some of the unaltered primary mineral; unfortunately, however, all the specimens received to date are of the same type, so it was decided to present the data available during Dr. Simpson's occupancy of the Presidential Chair of this Society.

Simpsonite occurs as flat tabular crystals in a quartz biotite pegmatite between a quartz blow and a felspar pegmatite outcropping a little to the north of the tantalite workings on Mining Lease 312 at Tabba Tabba (Lat. $20^{\circ} 43' S.$ Long. $118^{\circ} 57' E.$).

At the time of the writer's visit to the locality in July 1936 the vein had been opened out to a maximum depth of 8 feet.

All the specimens examined showed evidence of crystal development, many of them being similar in appearance, with a pronounced tabular habit, and a somewhat hexagonal outline (see Fig. 1). In no case was a complete crystal obtained, at the most the crystals being only half developed. They ranged in size from 0.5 cm. to 2.4 cm. maximum dimensions.

Parallel crystal growths, and penetration twins are common. Although the characteristic form of the crystals is well preserved all attempts at exact measurements of the interfacial angles on a two-circle goniometer failed owing to the impossibility of obtaining a satisfactory signal, partly due to the matte surface caused by weathering and partly to the development of many vicinal faces and small penetration twins.

Rough goniometrical measurements on crystals obtained by cementing small pieces of thin cover glass to the various faces were:—

Crystal A.		Crystal B.	
0°	$90^{\circ} 9'$	0°	$97^{\circ} 7'$
$9^{\circ} 28'$	$91^{\circ} 7'$	$56^{\circ} 52'$	$90^{\circ} 40'$
$57^{\circ} 0'$	$86^{\circ} 1'$	$57^{\circ} 53'$	$87^{\circ} 4'$
$55^{\circ} 56'$	$91^{\circ} 6'$	$54^{\circ} 25'$	$90^{\circ} 5'$

The basal plane is strongly developed and from the above readings it is obvious that there is a strong pyramidal development.

The X-ray examination of the mineral will be dealt with in a forthcoming paper by Miss L. E. R. Taylor.*

Under the microscope with reflected light it appears as colourless masses intergrown with a pale cream alteration product. With transmitted light a section of a crystal showed irregular cores of a transparent colourless anisotropic mineral bounded by interlacing veinlets of a small amount of a colourless isotropic mineral, which is intergrown with a pale cream almost opaque granular mineral without any crystal habit whatever (fig. 2). Narrow veins of muscovite and quartz cut across the crystals in places.

The refractive index of the anisotropic constituent, which is that to which I have given the name Simpsonite, was determined by immersion in a mixture of piperine and iodides and is proved to be $2.06 \pm$ with an extreme birefringence in the vicinity of 0.1. The mineral is uniaxial, positive.

No evidence of any cleavage or parting was apparent.

Simpsonite and its associated alteration products are unattacked by HCl and H_2SO_4 but are readily attacked by fusion with caustic alkalis, alkaline carbonates and potassium bisulphate.

Complete analyses were made of two selected crystals with the following results:—

Specimen.	A.		B.	
	Per cent.	Mols.	Per cent.	Mols.
Ta ₂ O ₅	72.31	1637	71.48	1618
Nb ₂ O ₅ ... ..	.33	12	.32	12
SnO ₂	2.00	133	1.19	79
FeO ... ..	.16	22	.44	61
MnO ... ..	.08	11	.04	6
CaO	3.40	606	3.19	569
Fe ₂ O ₃ ... ..	.14	9	.48	30
Al ₂ O ₃	16.75	1643	18.64	1829
K ₂ O ... ..	.24	25	.42	45
Na ₂ O	1.16	187	.68	110
PbO ... ..	.42	19	<i>Nil</i>	...
F	*.21	111	.38	200
H ₂ O+	1.35	750	1.39	771
H ₂ O— ... ..	.20	...	.03	...
SiO ₂	1.78	296	2.34	390
	100.53		101.02	
O = F ₂ ... ..	.09		.16	
	100.44		100.86	
Sp. Gr.	6.525		6.27	
Analyst	D. G. Murray.		J. N. A. Grace.	

*This figure is probably low as determinations of F by an improved method on other specimens have invariably given higher results.

*See page 93 this Journal, Editor.

D. G. Murray proved the absence of TiO_2 , BeO , UO_3 , ZrO_2 and Rare Earths in Specimen A.

In addition partial analyses were made of several crystals, the results obtained being—

Specimen.	C.		D.		E.	
	%	Mols.	%	Mols.	%	Mols.
3A (mainly Al_2O_3)	15.50	...	16.00	...	18.14	...
CaO	4.48	799	4.46	795	4.12	735
Na ₂ O	1.09	176	1.13	182	1.02	164
F ... ..	.86	453	.89	468	.81	426

The fluorine figures shown in the above partial analyses were obtained by H. P. Rowledge by an improved method.

All the specimens examined showed intergrowths of quartz and mica which would in all probability account for the SiO_2 and K_2O found.

An endeavour has been made to calculate from the analytical figures the constitution of the original Simpsonite and its alteration product.

After deducting the alumina, silica and water necessary to satisfy the potash to form muscovite and the remainder of the silica as quartz we are left with essentially tantalic and niobic oxides, lime, sodium, fluorine and water present as two distinct minerals.

It is to be noted that the partial analysis of specimens C, D and E show a constant molecular ratio of almost 2 : 1 : 1 for the Ca, Na and F respectively, irrespective of the amount of alumina present. This would suggest that these three constituents are combined in that ratio to form one of the tantalum-bearing minerals.

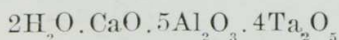
This formula was not adopted for the alteration product for the reason that no known fluotantalate of lime and sodium in that ratio has been recorded whereas the formula for microlite has been established both by analysis and synthesis as $CaNaTa_2O_6F$.

The alteration of tantalites into microlite by replacement of the iron and manganese by lime, sodium and fluorine has been recorded in this State in such cases as the alteration of manganotantalite and tapiolite whilst the alteration of stibiotantalite into microlite has been noted at Varutrask in Sweden.

Deducting the constituents to form microlite, calculated on the basis of the total sodium present, and allowing for the muscovite and quartz present we have the following molecular proportions for the original mineral Simpsonite.

Analysis.	A.	B.
$(Ta \cdot Nb)_2O_5$	4	4
Al_2O_3	5	5
CaO	0.9	1.2
H ₂ O+	1.8	1.9

giving a formula for the unaltered Simpsonite of



SUMMARY.

Simpsonite is a hexagonal basic tantalate of aluminium and lime with the composition $2H_2O \cdot CaO \cdot 5Al_2O_3 \cdot 4Ta_2O_5$, recorded for the first time from Tabba Tabba, Western Australia.

All the specimens examined were considerably altered.

It was found impossible to separate sufficient quantity of the pure minerals in order to definitely establish their composition.

The formula given for Simpsonite is based on the assumption that the associated alteration product in the specimens examined is microlite, the only known fluotantalate of lime and sodium.

In every case the specimens were too weathered on the surfaces to permit of exact goniometrical crystal measurements.

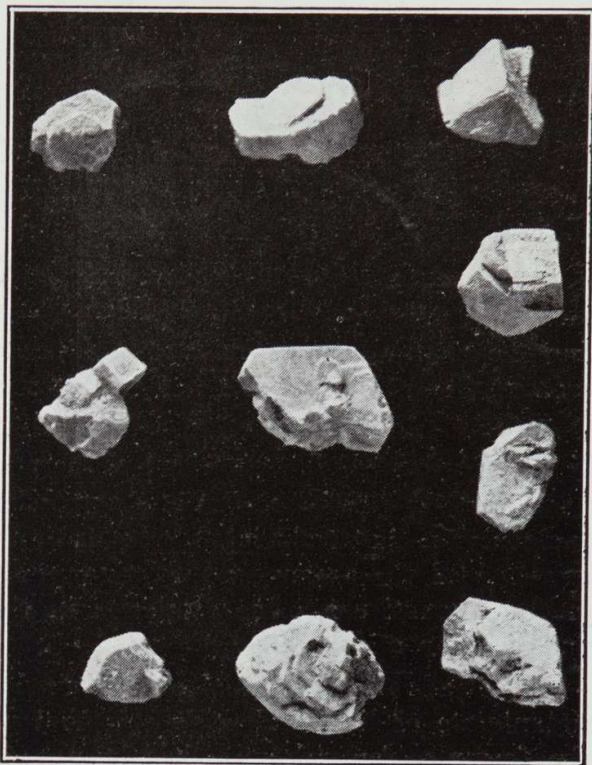


Fig. 1.—Natural size.

(Photo.: B. L. Southern.)



Fig. 2.—O.L. x 35.

(Photo.: J. N. A. Grace.)